



CAENZ

New Zealand  
Centre for  
Advanced  
Engineering

# ANNUAL REPORT 2008

ACTIVITIES





## From the Chair

CAENZ was founded upon a principle of “for the public good” and is grounded by the view that we are in the “serious business of the future of New Zealand”.

Now, more than at any time in our recent history, New Zealand faces significant economic and social challenges. It is imperative we make best use of our intellectual and natural resources to ensure our future economic, social and environmental wellbeing. Informed decision making is critical to such a future.

New Zealand needs the skills and the networks, which CAENZ provides – knowledge, analysis, the independent ability to ask the relevant questions and propose relevant and productive solutions.

We exist in order to accurately inform the debate on the technological challenges we face today and the ones we will face tomorrow. We add value through the unique way in which we are able to bring expertise, independence, a long-term view and inter-disciplinary approach to the development of solutions to many of these critical issues.

Our work will continue to be directly relevant and add value to the serious business of the future of New Zealand. We will add that value by raising awareness, investigating and analysing, and sharing and explaining the knowledge gained.

In 2008, our 21st year, we continued this tradition, but with that step change we committed to at our 20th anniversary, to position CAENZ as the major player providing expert comment and interpretation. We did this with a number of major projects, publication of two important reference books, visiting Fellows and international experts, and further steady development of the Distinguished Fellows Forum, bringing together key contributors in their fields of expertise.

I would like to acknowledge the continued support of the University of Canterbury, which provides our essential infrastructure support as well as the strong relationship we enjoy with the Engineering Schools of the Universities of Canterbury and Auckland. I would also like to acknowledge our Foundation Partners – Transpower NZ Limited, GNS Science and ONTRACK – and all our sponsors and supporters.

I stepped in to the role of Chair of CAENZ at the end of 2008, taking up the reins from Colin Martin. Colin served twelve years as a CAENZ Director, more latterly as Chair. Earlier in the year we marked the retirement of Francis Small, who had been Chairman for over ten years. I would like to acknowledge the huge contribution both made to CAENZ and to New Zealand during their time on the Board.

I would also like to acknowledge the contribution of Dr Robin Mann, Chancellor of the University of Canterbury, who also retired from the CAENZ Board at the end of 2008. Robin’s active engagement in CAENZ’s affairs did much to reinforce the special relationship we have with the University.

This report for 2008 provides a summary of CAENZ’s activity throughout the year. It reflects an important, relevant body of work which will add value to New Zealand.

**Bruce Chapman**



## Executive Director Report

This past year has shown once again CAENZ's capacity to play a strong knowledge-brokering and facilitating role within New Zealand's engineering and technology sectors.

CAENZ has a unique ability to provide and access the top-level engineering and cross-discipline resources necessary to develop and deliver superior and complex investigative and analytical thinking, and the ability to apply this thinking to its project activity, its workshops and its publications. The Centre has therefore been able to maintain a strong presence at the forefront of national decision making in a number of key areas affecting the New Zealand energy and infrastructure systems.

In today's uncertain times one of the key challenges facing New Zealand will be to achieve world-class delivery of our critical infrastructure systems and ensure that proposed investment in New Zealand's infrastructure delivers the benefits hoped for.

We must continue with modernisation of our energy systems and look to new opportunities for energy supply in ways that will leverage New Zealand's competitive position in the global market place.

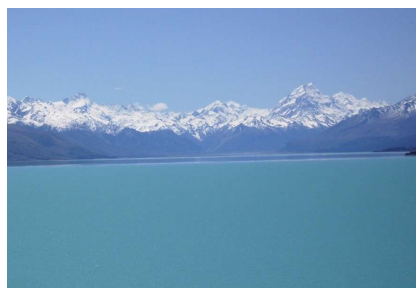
It is not sufficient that we merely aim to meet current imperatives without giving recognition of the long term effects of decisions taken now. If one accepts the premise of the need to embark on a pathway that reduces carbon emissions then there is a long road, of the order of decades, before we are likely to see the widespread adoption of the transformational technologies that will be necessary if society's objectives are to be realised.

CAENZ sees itself at the forefront of creating that agenda for change. By adopting a long-term approach, and undertaking the investigative and critical analysis that contributes to policy interventions that maximise opportunities for New Zealand, we can do much to address these challenges and prepare the way for future generations.

So in 2009, CAENZ will continue to focus on the issues and challenges relevant to a successful future for New Zealand, and to add value to the way in which we confront those challenges.

These are challenging times and support and engagement in our programmes will be essential if we are to carry on with the projects and knowledge dissemination which will make a difference to New Zealand. In order to deliver on our aims we will continue to look to our academic, science and practitioner partners for support and engagement in our work. It is this collaborative approach that is the hallmark of CAENZ activity. We invite you to join us.

**George Hooper**





“*In a world of change and increasing complexity, New Zealand needs new solutions for transforming ideas into reality.*”



## *CAENZ is in the serious business of the future of New Zealand.*

### Strategic Direction

Throughout 2008 we have remained true to the principles which underpin our mission, objectives and programmes, to progress knowledge and advance solutions for the benefit of present and future generations

We have delivered all of our initiatives in line with the Centre's DIRECT approach:

**Differentiated:** Strongly networked, forward-thinking, and providing a stimulus for collaborative action.

**Independent:** Non-profit structure, and self-funding. A trusted source of information.

**Relevant:** Focused on major issues for New Zealand, especially economic and social performance.

**Efficient:** Established project management systems, based on low overheads and a core team.

**Competent:** Engaging recognised subject-matter experts, and structuring each project to suit end objectives.

**Thought Leadership:** Sourcing latest international thinking for New Zealand and guiding Pathfinder projects.

### CAENZ as a Think Tank

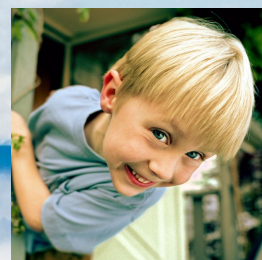
Foremost among the roles for CAENZ, is the role of Think Tank. CAENZ facilitates the cross-pollination of knowledge across disciplines and institutional boundaries, as well as contributing to projects of national importance.

### CAENZ as an Integrator

CAENZ plays a strong integrating role within New Zealand's engineering and technology sectors. Our work is characterised by networking and collaboration which, through broad participation, is addressing some of the most difficult challenges of our time.

### CAENZ as an Awareness Raiser

CAENZ provides expert commentary and interpretation on major issues of the day, and highlights the vital importance of engineering-thinking and technological advance for a strong and growing society.





## Project Activity 2008

### Energy System Modernisation

Energy is fundamental to our economy and our everyday lives, yet the extent of our dependence, and the strategic risks relating to that dependence, has been largely overlooked. This is largely due to the fact that in New Zealand we have benefited from decades of cheap oil, exceedingly cheap natural gas, and an “apparent” unfettered supply of all consumer energy types such as electricity and transport fuels.

We have ignored the inevitability of depletion of current energy stocks without sufficient new investment in either exploration or generation.

And we have ignored the fact that as our demand for energy increased, we would reach a point where the service life of our aging transmission and distribution networks would be placed at risk.

We know that economic development is reliant on adequate, reliable and secure energy supplies, but put little effort into using energy more efficiently. The higher energy prices and supply constraints experienced recently are not technical problems, but socially constructed issues due to the lack of appreciation of the complex interrelations between energy systems and the society we live in.

On top of this there is also public interest and concern about the ongoing use of fossil fuels and the resultant enhanced greenhouse gas emissions to the atmosphere, and increasing debate about the cost and timeframes for investment in renewable resources.

The issues go further than just energy. CAENZ's report on *An Analysis of the Effect of Renewable Energy Targets in the Electricity Sector on the New Zealand Gas Industry* argued that we will not address the heart of the energy problem unless due recognition is placed on the resource and ecological constraints of the systems in which we live.

The scale and seriousness of the problem is now evident. Major changes are needed in both the demand and supply side of New Zealand's energy system. The issue is one of transformation, a need for a new approach.

CAENZ has access to a wide range of experts and associates in the energy field, which allows us to undertake expert market analysis as well as valuable policy research. Our business network also allows us to access a wide range of business thinking, which enables us to bring together government and industry inputs into its projects, while acting as an impartial arbiter to ensure the veracity and reality of its findings.

Within this context, 2008 was a busy year for the Centre's energy systems modernisation programme, with a heavy focus on current and future policy decisions and how these affect New Zealand.

The year began with an investigation into the effects on the electricity sector, and the flow on effects to the gas exploration sector, of the government's 90% renewables target and proposed moratorium on new thermal generation.

This study, funded by PEPANZ, highlighted the importance of natural gas for both primary energy and security of electricity supply, and as a transitional fuel towards a higher percentage of renewables. It also raised concerns that announced policies would have a detrimental effect on the gas industry, particularly in new gas exploration, leading to and exacerbating potential gas shortages in the future.

In other work CAENZ has endeavoured to foster local government connections and explore how local government and policies can impact on community and regional energy security and sustainability. Many energy-related activities are strongly influenced by policies, plans and initiatives administered at a local government level. This work included:

- A report to help ECAN understand how energy is addressed through its current policy portfolios, and the interrelationship between energy and other portfolios such as water, land use and air quality.
- A draft discussion document for stakeholder consultation on an energy sustainability plan for the Waitaki District. It is intended



to provide a platform for community engagement with local government in developing more sustainable economic development plans, infrastructure development plans and their supporting regional and district plans. The objective is to establish a business environment that maximises the communities' ability to create wealth from its local resources without compromising environmental sustainability or lifestyle.

- Provision of data on future pricing relativities for non-petrol and diesel fuels as part of the Auckland Regional Council's energy strategic review.

CAENZ continues to actively engage in these fields and aims to work with others to further increase understanding of the important interrelationships that govern our energy system.

#### **CAENZ Resource Frontiers Programme – Gas Hydrates**

New Zealand is blessed with an abundance of natural resources both real and intrinsic, with a willingness to preserve our natural environment. This provides a significant challenge to New Zealand – while we know a good deal about our terrestrial surroundings we know very little about the 80% of our territories that lie under water.

Significant wealth has been extracted from the Taranaki Basin and it is generally accepted that New Zealand marine territories have great potential for more, but are still relatively unexplored.

This need for exploration and the potential for future energy supply means New Zealand must maintain a sufficient research capability to support the development of the country's available resources in timeframes that ensure they are available when needed.



CAENZ's ability to form and develop relevant and strategic stakeholder linkages and relationships adds value to this key debate and challenge that confronts New Zealand.

One element of this is opening opportunities for dialogue. Working with Crown Minerals, CAENZ organised a very successful session on the potential for Gas Hydrates at the 2008 National Petroleum Conference. The lessons learned and knowledge gained from the session contributed to private briefings to politicians, government agencies and other stakeholders post-Conference on the potential opportunities for the future.

A key outcome of this was the formation of the New Zealand Gas Hydrates Advisory Board, where CAENZ is actively participating alongside Crown Minerals, Geosphere, GNS and NIWA. CAENZ's international linkages and relationships with other key international technical and engineering players in the gas hydrates research space, along with the coordination of local expertise, is adding significant value to this technical field of major strategic importance and economic concern, and potential, to New Zealand.

This activity has resulted in the organisation of two further international visiting experts and the commencement of a major study during the year on *An Options Analysis for the Commercial Development of New Zealand's Gas Hydrates Resource Endowment*. This work is intended to identify potential development pathways to commercialise New Zealand's gas



hydrates resource opportunities and provide the catalyst for the development of a national strategy.

### Construction and Infrastructure

New Zealand has great opportunities. It also faces significant challenges. Pivotal to securing New Zealand's future is access to resources and a modernisation of New Zealand's critical infrastructure systems.

A major contributor to infrastructure development and its maintenance is the construction industry. The efficiency and performance of the construction industry therefore has a major part to play in overall infrastructure effectiveness, and therefore the economic efficiency of the country.

CAENZ has engaged in wide consultation with industry to look at the ways in which New Zealand firms procure, deliver and maintain infrastructure projects. The wide-held view of the major stakeholders is that there is significant scope for improvement within the sector and that the benefits of improved performance will

flow to all in the supply chain, and ultimately to the economic well-being of the economy and the country.

The strategic objective of CAENZ's construction programme has therefore been to assist the construction industry to develop and adopt Best Practice Principles and promote a culture of continuous improvement and informed change.

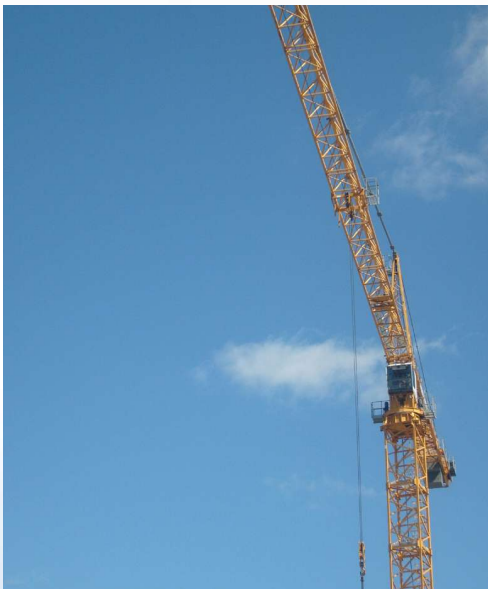
Given Government's role as a major stakeholder – as a user, owner, contractor and investor – a core element of the Programme has been to promote to government itself the importance of adopting an infrastructure road map and other actions to ensure its investment in core infrastructure deliver greater value.

Recent work has focused on the essential systems and infrastructure that underpin a modern society. There are numerous issues that need to be addressed within the infrastructure sector.

CAENZ is already a leader in developing a more thorough understanding of the vulnerability of local infrastructure to natural hazards, lifelines and the development of engineering solutions for improved infrastructure resilience.

A systems approach to improving understanding of the connections and inter-dependencies that govern infrastructure investment has formed the basis for ongoing activity in this area. A systems approach offers a more effective way to view complex, interconnected, real works problems. The major study of the year, *A Study into the Cyclical Performance of the NZ Construction Industry*, supported by funding from the Building Research Levy, looked at the cyclical performance of the construction sector using these techniques.

CAENZ identified the need for a significant





shift in policy and institutional arrangements to reduce financial waste and the loss of capital and skills from the industry. This is a vital component in ensuring the development of a robust and cost-effective infrastructure.

CAENZ presence within the sector is maintained through the *ConstructingNZ* newsletter, which continues to grow in readership and covers a wide range of topics related to project and construction management.

CAENZ also organised another successful series of introduction workshops for the industry on the NEC contract that now seems to be gaining acceptance and serious consideration in NZ, and continues as a member of the Construction Industry Council (CIC).

### **Risk and Natural Hazard**

Natural hazards pose risks not only to people, but also to infrastructure such as electricity transmission lines, dams and roads, which in turn pose further risks to people.

CAENZ's natural hazard programme focuses on understanding and assessing the causes, effects and potential management of natural hazards.

The Earthquake Commission (EQC) has commissioned CAENZ to undertake a multi-stakeholder study to identify ways to improve planning for the management and use of landslip vulnerable land. This is done by measuring the effectiveness of existing land use planning methods in reducing landslips.

The study is also identifying barriers to best practice and developing appropriate solutions to reducing those barriers. The objective is to reduce exposure to natural hazard risk.

The study involves a wide range of participants including GNS Science and several regional councils throughout New Zealand. Also involved in the study is the Ministry for the Environment, the Ministry for Civil Defence and Emergency Management, the Department of Building and Housing and various independent consultants/advisors.

Recovering from natural hazard events is also a key focus for CAENZ. To that end, CAENZ organised a three week visit by CAENZ Visiting Fellow Jim Schwab. Jim is a senior research associate and manager of the Hazards Planning Research Center of the American Planning Association.



Jim gave the keynote address to the Australasian Natural Hazards Conference in Wellington on 28-31 July 2008, and worked with regional and local councils on how to use planning to recover rapidly from extreme events. He also delivered several public forums.

As part of the Australasian Natural Hazards Conference, CAENZ organised a plenary session to discuss and debate how land use planning and standards may be used in the future to promote best practice in natural hazards management.

Also well received was the workshop on Infrastructure Vulnerabilities – the role of risk communication, drawing upon CAENZ's extensive prior work on risk communication.

Again, this demonstrates CAENZ's ability to form and develop relevant and strategic stakeholder linkages and relationships with key international players, which add value to key debates and challenges which confront New Zealand.

### **Alerting the Public**

In a related area, and drawing more upon CAENZ's technical networks, CAENZ undertook a high level assessment of potential obstacles for a national telecommunication public alerting system within the current telecommunications network for MCDEM.

This study audited what is currently achievable within the telecommunications networks in New Zealand and identified issues to be addressed in developing an integrated national public alerting system incorporating telecommunications. This report will be used to help lay the ground work for specifying the requirements for such a system and inform decision makers upon the real capacity and constraints of current telecommunication systems.

## Invest in the Future

CAENZ is an independent, not-for-profit organization funded by a Trust established specifically for that purpose.

Trust funding is augmented by grants, sponsorships and income derived from CAENZ's programme of educational events such as conferences and workshops addressing topical, relevant issues.

In 2007 CAENZ established a Patronage Programme, the objective of which is to strengthen the organisation's financial base.

A strong financial base enables independence of approach to strategic objectives and project work. In turn, the Patronage Programme provides for increased stakeholder involvement in the work of CAENZ.

The CAENZ Patronage Plan has five tiers of support, the top two being:

### Foundation Partners

Up to five Foundation Partners receive access to a team of experts to provide independent advice on technology, and a dedicated resource for the development of Partners' ideas and projects.

They will have facilitated access to a variety of networks by way of CAENZ, Advisory Board members, university academics and international leaders in technology and engineering. Other benefits include:

- Private briefings from visiting Fellows, distinguished lecturers, political leaders and others.
- Individual recognition of the Foundation Member and his/her nominating company in all CAENZ publications, promotions and speeches.
- A framed certificate for the sponsoring company's use.
- All benefits listed below for the Distinguished Fellows programme.

Financial Commitment: \$20,000

There are currently three Foundation Partners:

- Transpower New Zealand Limited;
- GNS Science; and
- ONTRACK.

These Partners are crucial to the financial well-being of CAENZ and to its ability to undertake its role.

### Distinguished Fellows

The Distinguished Fellows Forum is a select group of opinion-leaders and experts in the engineering and technology sectors, willing to share their expertise and knowledge.

Distinguished Fellows in turn help position CAENZ as the major player providing comment and interpretation, and adding value through its ability to draw on this level of expertise.

CAENZ facilitates Distinguished Fellows forums where Fellows can meet regularly to discuss, listen, debate, share and progress strategic issues of mutual interest.

Forums often include guest speakers, and opportunities to meet and consult with politicians and government leaders on relevant policy issues, and personal invitations to all CAENZ functions.

Other benefits include:

- Foundation Members and Distinguished Fellow's annual dinner.
- Free entry to lectures and seminars.
- Copies of all publications.
- Newsletters.
- Regular updates on programmes – Construction and Energy.
- Individual recognition of the Distinguished Fellow and his/her nominating company in all CAENZ publications.

Financial Commitment: \$7,500

*See the inside back cover for a list of our Distinguished Fellows.*

*We invite you to join us and support the work of CAENZ.*

*In doing so, you will be contributing to the work of CAENZ, adding value to addressing the challenges confronting you, your business, the economy and New Zealand.*

*Contact details are given on the back cover.*

## Calendar

### ► Highlight Events

<b>February</b>	Submission to Select Committee – Climate Change (Emissions Trading and Renewable Preference Bill)
<b>March</b>	Presentation at the Hydrates Session, New Zealand Petroleum Conference, plus post-conference private briefings to ministry officials, Wellington
<b>April</b>	1 <sup>st</sup> Distinguished Fellows Forum, Wellington
<b>May</b>	NZ Energy Information Handbook Launch, Christchurch  “Taking Stock of Hazards and Risks” – 2 day workshop on Natural Hazards, Christchurch  “Cyclical Performance of the NZ Construction Industry”, Seminars held in Wellington & Auckland
<b>June-July</b>	New Engineering Contracts Workshops held in Wellington and internally with a number of companies
<b>July</b>	Workshop “Infrastructure Vulnerabilities – The Role of Risk Communication”, held in conjunction with the 2nd Australasian Natural Hazards Management Conference, Wellington  CAENZ Visiting Fellow – Jim Schwab  2 <sup>nd</sup> Distinguished Fellows Forum, Auckland
<b>August</b>	Carbon Abatement Workshop held in Auckland
<b>November</b>	3 <sup>rd</sup> Distinguished Fellows Forum, Wellington
<b>December</b>	“Land Use of Land Slips Prone Land” workshops held for the Lower Hutt and Far North District Councils  Release of the Report “Cyclical Performance of the NZ Construction Industry” breakfast held in Christchurch

### ► Project Outputs/Reports

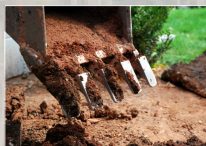
<b>February</b>	An Analysis of the Effect of Renewable Energy Targets in the Electricity Sector on the New Zealand Gas Industry  New Zealand Distributed Generation Inventory for EnergyScape Project
<b>June</b>	Identifying the Linkages between Energy Policy and other ECAN Policy Portfolios
<b>November</b>	A Study into the Cyclical Performance of the New Zealand Construction Industry
<b>December</b>	Understanding the Contribution of Direct Use of Gas to New Zealand’s Future Energy Efficiency Objectives (Second Edition)

### ► Publications

<b>April</b>	<i>New Zealand Energy Information Handbook – Third Edition</i> (book + CD)
<b>July</b>	<i>Fire Engineering Design Guide – Third Edition</i> (book + CD)  CAENZ <i>InfoDirect</i> newsletter (April, August, October)  <i>ConstructingNZ</i> newsletter (February, June, August, October)

### ► Visiting Fellows

<b>March</b>	Steve Hancock (RPS Energy, Canada) & Brenda Pierce (US Department of Energy)
<b>July/August</b>	James C Schwab, Manager, Hazards Planning Research Center, American Planning Association
<b>August</b>	Dr Karen Kozlieski, CSIRO, Melbourne
<b>September</b>	Professor Carolyn Koh, Colorado School of Mines





## Foundation Partners

GNS Science  
ONTRACK  
Transpower New Zealand Limited

## Distinguished Fellow

Benfield NZ Limited (trading as AonBenfield)  
Energy Efficiency and Conservation Authority  
Fletcher Construction  
Fulton Hogan Limited  
GNS Science  
Ministry of Civil Defence & Emergency Management  
New Zealand Steel Limited  
ONTRACK  
Opus International Consultants  
Solid Energy New Zealand Limited  
Transfield Services Limited  
Transpower New Zealand Limited

Richard Trevethick  
Mike Underhill  
David Jewell  
Lindsay Crossen  
Dr Desmond Darby  
John Hamilton  
Norm Clark  
Peter Steel  
Bill Darnell  
Dr Don Elder  
Roger Foy  
Kieran Devine

## CAENZ Board of Directors

Bruce Chapman  
Dr Nicki Crauford  
Rex Williams

NZ Historic Places Trust  
The Institute of Directors in New Zealand  
Chancellor, University of Canterbury

Chair  
Deputy Chair  
Chair, CAENZ Trust

Prof. John Boys  
Dr Desmond Darby  
Prof. Michael Davies  
Kieran Devine  
Prof. Conan Fee  
John Gardiner  
Ian Gilmour  
Pat Helm  
Prof. Peter Jackson  
Tony Nicklin  
Peter Steel  
Dr Alan Wood

University of Auckland  
GNS Science  
Dean, Faculty of Engineering, University of Auckland  
Transpower NZ Limited  
University of Canterbury  
Department of Building and Housing  
University of Canterbury  
Department of Prime Minister and Cabinet  
Pro Vice Chancellor, University of Canterbury  
Independent Director  
ONTRACK  
University of Canterbury

John Boshier  
Brian Wood  
Dr George Hooper

National Generators Forum, Australia  
Holmes Wood Pty Limited, Australia

Associate Director  
Associate Director  
Executive Director

## Retired Directors

Prof. Pat Bodger  
Gerry Te Kapa Coates  
Dr Robin Mann  
Colin Martin  
Dr Roger O'Brien  
Graeme Robertson  
Dr Francis Small  
Richard Westlake

University of Canterbury  
Wise Analysis Ltd  
Chancellor, University of Canterbury  
Independent Director  
O'Brien Consulting Ltd  
Lincoln Ventures Ltd  
M King and F Small Consultancy Ltd  
Westlake Consulting Ltd





University of Canterbury Campus  
Private Bag 4800  
Christchurch 8140  
New Zealand

39 Croyke Road  
Ilam  
Christchurch  
New Zealand

Phone: +64 3 364 2478

Fax: +64 3 364 2069

e-mail: [info@caenz.com](mailto:info@caenz.com)

web: [www.caenz.com](http://www.caenz.com)

